

PINGUICULA IN THE SHADOW OF MOUNT SHASTA, CALIFORNIA

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I first learned of the presence of butterworts in the Castle Crags Wilderness area in the summer of 1995. An unexpected telephone call revealed the presence of butterworts in a rather obscure and heretofore unreported location over 100 km east or southeast of all previously reported sites in Siskiyou County, California or Josephine County, Oregon. Was this some kind of a hoax that some of my carnivorous plant buddies had manufactured?

Perhaps, but the possibility was tantalizing—butterworts so far from any known distribution. These plants were seemingly locked into a cirque and surrounded by colorful locales known as the Devils Pocket, Panther Rock, Bear Ridge, and Fawn Creek. Surely this would be worthy of a day trip even if it was only a simple diversion.

Initial research about the area revealed the majestic Mt. Shasta (4329 m / 14,200 ft) to the east and the less imposing Mt. Eddy (2752 m / 9025 ft) to the north. Forest Service data indicated the area was a byproduct of Pleistocene glaciations with resultant serpentine soils in abundance (Keeler-Wolfe 1990).

Rare plants noted in the Forest Service Research Natural Area surrounding this site included a new species of manzanita (*Arctostaphylos klamathensis*), the cobra lily (*Darlingtonia californica*), a true lily (*Lilium washingtonianum* var. *purpurascens*), and a sedge (*Carex gigas*) (Keeler-Wolf 1982, 1989). Significant fauna included spotted-owl (*Strix occidentalis*), pine marten (*Martes americana*), wolverine (*Gulo gulo*), and mountain lion (*Felis concolor*). Yes, this certainly sounded as though it could be an interesting place to visit.

Alas, to get anywhere near this site, I would have to wait until July for the snows of winter to melt away. My approach to the site was on a paved road that turned into rutted gravel, which devolved into the glacial moraines alluded to above. Much later the various lakes came into view surrounded by intermittently forested cliffs.

The original site for *P. vulgaris* subsp. *macroceras* Link at 1829 m (6000 ft) near the Curious Lake¹ [PUA # xxxxx, 7/12/86] was noted by Glenn Clifton in streamside habitat. *P. vulgaris* subsp. *macroceras* is the official taxon for butterworts found in northern California and southern Oregon, although as many of you know *P. macroceras* subsp. *nortensis* was proposed several years ago by Rondeau and Steiger (1997). This name has now become widely dispersed in botanical journals.

Again in 1996, both Clifton and D. W. Taylor returned to this area, but noted the elevation as 1921 m (6300 ft) [JEPS #xxxxxx, 7/26/96] with both *Drosera rotundifolia* and *Darlingtonia californica* on serpentinized gabbro in "...a wet seepage area..." above Curious Lake. Later in this decade I would also determine the most obvious source of this "seepage", and its distinct relevance to my quest.

Field Research

In July of 1996 and seemingly well prepared with all this information, I faced the Curious Lakes complex for the first time and my first thought was: Where to now? There was no one "site" to sur-

¹Note: Curious Lake(s) is a fictitious name that is used in this paper to protect the true identity of this private property site within the Shasta-Trinity National Forest. All collection numbers for herbarium specimens have been deleted to serve this same purpose.

vey, but rather only a series of circular vistas of rock and trees climbing skyward. Little did I know then that I would spend the next 10 years wandering in this wilderness.

My first two visits with carnivorous plant enthusiasts and off-road specialists Bruce Bonar and Stephanie Changaris turned into scoping and reconnaissance missions by both foot and boat primarily looking for access to seepy sites draining into Curious Lake. During this time various lakes were visited and searched for possible unreported sites or points of access that had not yet been found. Swimming across the lake was very refreshing, but ultimately unproductive for every potential take-off point found to higher seepy ground was now unreachable without boots. The surrounding area supported *D. californica* and *D. rotundifolia* abundantly and two species of *Utricularia*, but none of the butterworts that had previously been reported.

A few years later I enlisted the help of Arthur Yin and Gina Morimoto in the hope of bringing a fresh perspective to the mysteries of this site. Our initial visits were again unproductive, but in 2002 a key piece of information trickled down from the Forest Service: a compass heading at which these plants were said to have been seen. Finally, we had the missing link—a direction from which to launch out of the water onto the cirque.

In the late summer of 2005, Arthur and Gina did find one site for butterworts in the area previously predicted by Forest Service information and some of the other data we had compiled over the years. Unfortunately, that was in September, hence no flowers were available for a definitive identification. My review of specimens at Jepson Herbarium in 2006 indicated that the species found there appears to be a “macroceras” type, but of course I would love to see some fresh material for further evaluation. Barry Rice and Beth Salvia also visited this site in the fall of 2006, but of course it was too late again for any blooming material.

So it was in June 2007, as I had become Captain Ahab resolved to take just one more shot at what could have easily become my Moby Dick after enduring hot days, cold nights, thunder-lightning-hail on my head, and enough illusions to write a damn book. Using Arthur’s stealth trail, I went around the southwest corner of the lake and slowly up the hill into the seepy area and had my Eureka moment—butterworts in eastern Siskiyou County!

Curiously, although I was the last one of our small group to reach this site, perhaps it was only fitting that I was the first to see these butterworts in bloom with associated species such as *Chamaecyparis lawsoniana*, *Arctostaphylos* spp., *Cornus stolonifera*, *Rhododendron occidentale*, *Leucothoe davisiae*, *Carex* spp., *Dodecatheon* spp., *Lillium* spp., *Phyllodoce empetriformis*, *Cassiope mertensiana*, *Platanthera sparsiflora*, and *Listera convallarioides*. *D. rotundifolia* was also reported to have been seen here in the past, and although it is quite abundant at lower altitudes, it has not been seen with these *Pinguicula* yet.

Observations & Conclusions

Now that I have been there and done that, does anyone care just what species might be lurking here? Or just why is it here at what Dean Taylor called a “...very crazy site...” apparently under our botanical radar for who knows how long? Of course, I believe that someone cares, so I have prepared some information for you about the two issues that must be considered regarding this site: taxonomy and plant distributions in general.

First, having seen these plants in bloom, and after completing a review of the limited statistical data available on calyx shape, corolla and spur length, it appears that this species is some form of *P. macroceras* Link as outlined in Table 1 (Casper 1962). Curiously, it just happens to occur on serpentine soil, where I have often seen it throughout its range in western North America. It is also

Table 1: Comparison *P. macroceras* and *P. vulgaris* W. North America (H. Rondeau 2007, ver. 1.1).

| Element/ Characteristic | <i>Pinguicula macroceras</i> | <i>Pinguicula vulgaris</i> | Comments |
|--|---|---|---|
| Habitat: | Often petrophillous; esp. on serp. CA, OR (excl. Wallowa Mts.), WA (excl. Olympic Mts.) | Var. but usually lakeshore/floodplain | |
| Corolla length: | 18-27 | 14-22 | Casper (1962, 1966) |
| Corolla lobe shape: | Subobovate-oblong, edges touch/overlapping | Oblong, not covering nor touching | Casper (1962, 1966) |
| Spur length: | 6-11 | 3-6 | Split spur/s tip noted at CL (Rice <i>et al.</i> 2008), previous reports of same not known |
| Calyx: | Split up to ½ length | Split up to ⅔ length | Casper (1962, 1966) |
| Capsule: | Ovoid (Casper 1966) | Ovoid (Casper 1966) | <i>P. m. nortensis</i> : Globular (Rondeau & Steiger 1997) |
| Chloroplast-DNA | Appears to support Casper (1966), but see conclusions | Appears to support Casper (1966), but see conclusions | Note Cieslak <i>et al.</i> (2005) |
| Nuclear ribosomal ITS | Appears to support Casper (1966), but see conclusions | Appears to support Casper (1966), but see conclusions | Degtjareva <i>et al.</i> , (2006), Degtjareva (pers. comm. 2007) |
| Seed Shape: | Micropylar appendage absent | Micropylar appendage present | Degtjareva <i>et al.</i> , (2004), Degtjareva (pers. comm. 2007) |
| Trichomes (pubescence) in corolla tube. Three specific areas noted in Godfrey & Stripling (1961) | Casper (1966) Is variation significant? | Casper (1966) Is variation significant? | (Rondeau & Steiger 1997); <i>P. m. nortensis</i> only; significance noted in description |

found at a record high altitude (>1890 m /6200 ft) for this species in both California and western North America.

Kruckeberg (1984) listed *Pinguicula vulgaris* L. in California as a bodenvag or indifferent taxon, while Alexander (2006) implicated *P. macroceras* as part of the “...California Pitcherplant Alliance...” (*Pinguicula*, *Drosera rotundifolia*, and *Darlingtonia californica*). Certainly these species are often found on serpentine throughout northwestern California and southwestern Oregon, but

this group is rarely seen together in the field. Rondeau and Steiger (1997) had noted high serpentine affinities for our *P. m.* subsp. *nortensis* taxon and other researchers (Walker 1954; Whittaker *et al.* 1954; Kruckeberg 1984; Brooks 1987) have had much to say about this edaphic phenomenon as well.

However, the current the state of research on *Pinguicula* (Degtjareva 2002, 2007; Degtjareva *et al.* 2004, 2006; Cieslak *et al.* 2005) indicates that perhaps a synthesis of our western species is at hand. My reading of the current research, discussion with one of the primary authors involved, and in consideration of current trends in angiosperm phylogeny (Stevens 2007) used in the Flora of North America, appears to show that *P. macroceras* and *P. vulgaris* are merely sisters under their skins. I think that the species name *macroceras* should now be applied to all *Pinguicula* from California to British Columbia and Montana with possible extensions of this name to both Alaska and Japan in the future.

One expert (Rivadavia 2008) has offered a note of caution on this conclusion, stating that the most definitive test on the DNA of all species concerned has not yet been performed. Certainly, additional research should and will be done in the future regarding both DNA and seed characteristics as has been suggested by Rivadavia (2008) and outlined by Cieslak *et al.* (2005), Degtjareva (2002), Degtjareva *et al.* (2004, 2006), and Soltis *et al.* (1997) to further clarify these taxonomic issues. Looming on the horizon, there is even the possibility that DNA barcoding of plants may be a possible source of determining taxonomy (Cameron 2007; Hollingsworth 2008).

Second, is this isolated population simply a quirk of fate as some seeds fell out of the sky via avian transport—avichory, as migratory golden plovers have been implicated in the creation of the disjunct population of *Drosera anglica* to the Alakai Swamp in Hawaii (Gon 1994)? I have seen both spotted sandpipers and lesser yellow-legs in many western fens picking their way through both plants and fruits. Perhaps they were transported here from some closer, yet unknown site by mammals—zoochory (Molau 1990), or through simple aquatic transport—hydrochory (Danvind & Nilsson 1997).

Also, as has been suggested by more than one botanist, is this apparently disjunct site actually relictual—was *Pinguicula* once far more widespread in California or Oregon than it is now? Have these plants been evolving here long enough for speciation to have already occurred, and where will the next disjunct population of *Pinguicula* be found? For those who may wish to jump into this exciting field work, I would encourage you to concentrate on the following areas: Gray Rock Lakes, Mumbo Basin, Gumboot Lakes, Picayune Lake, Marble Mountain, Trinity Alps, and the Siskiyou Wilderness.

Of course, the question of global warming or global climate change must also be considered as other plant populations are already climbing uphill, blooming earlier, or simply going extinct in their attempts to escape some of these effects (Lesica & McCune 2004; Malcolm *et al.* 2006; Banks 2006; Nijhuis 2007; Primack & Miller-Rushing 2007). The current projection for much of northern California is increasing the amount of winter precipitation that falls as rain, not snow, as is normal here from late October through March. It will be interesting to see just how this will affect the butterworts at Curious Lake.

N.B. 1. Note of caution to all who might follow in my footsteps: This area is private property located within the national forest, and it is a potentially dangerous area—footings are irregular and unpredictable; use of handholds on both rocks and trees on slopes is highly recommended.

N.B. 2. Additional research on other special interest plants is also being conducted on this vast area south and west of Curious Lakes known as the Trinity Ultramafic Region (James *et al.* 2002).

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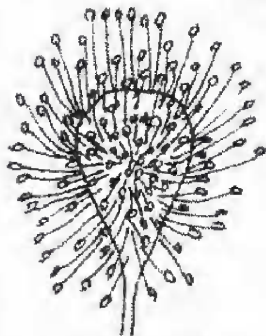
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